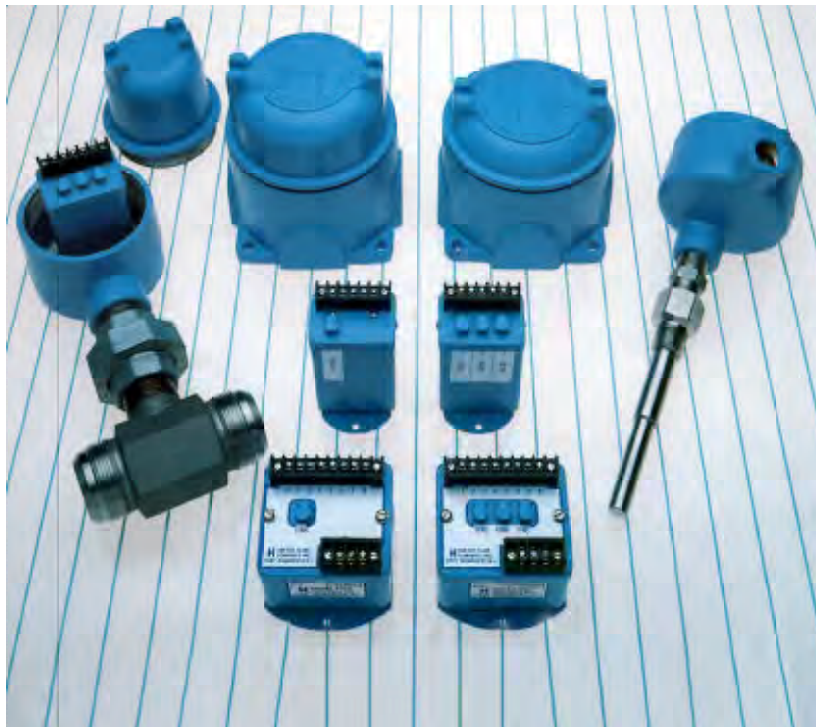


ACC-27

SIGNAL CONDITIONER

USER'S MANUAL



HP-246
August 2004

H **HOFFER FLOW CONTROLS, INC.**
The Turbine Flowmeter Company

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Notice

HOFFER FLOW CONTROLS, INC. MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

This manual has been provided as an aid in installing, connecting, calibrating, operating, and servicing this unit. Every precaution for accuracy has been taken in the preparation of this manual; however, HOFFER FLOW CONTROLS, INC. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that may result from the use of the products in accordance with information contained in the manual.

HOFFER FLOW CONTROLS' policy is to provide a user manual for each item supplied. Therefore, all applicable user manuals should be examined before attempting to install or otherwise connect a number of related subsystems.

During installation, care must be taken to select the correct interconnecting wiring drawing. The choice of an incorrect connection drawing may result in damage to the system and/or one of the components.

Please review the complete model number of each item to be connected and locate the appropriate manual(s) and/or drawing(s). Identify all model numbers exactly before making any connections. A number of options and accessories may be added to the main instrument, which are not shown on the basic user wiring. Consult the appropriate option or accessory user manual before connecting it to the system. In many cases, a system wiring drawing is available and may be requested from HOFFER FLOW CONTROLS.

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RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the Hoffer Flow Controls Customer Service Department, telephone number (252) 331-1997 or 1-800-628-4584. BEFORE RETURNING ANY PRODUCT(S) TO HOFFER FLOW CONTROLS, PURCHASER MUST OBTAIN A RETURNED MATERIAL AUTHORIZATION (RMA) NUMBER FROM HOFFER FLOW CONTROLS' CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned RMA number should then be marked on the outside of the return package and on any correspondence.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting HOFFER FLOW CONTROLS:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS OR **CALIBRATIONS**, consult HOFFER FLOW CONTROLS for current repair/calibration charges. Have the following information available BEFORE contacting HOFFER FLOW CONTROLS:

1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

LIMITED WARRANTY

HOFFER FLOW CONTROLS, INC. ("HFC") warrants HFC's products ("goods") described in the specifications incorporated in this manual to be free from defects in material and workmanship under normal use and service, but only if such goods have been properly selected for the service intended, properly installed and properly operated and maintained. This warranty shall extend for a period of one (1) year from the date of delivery to the original purchaser (or eighteen (18) months if the delivery to the original purchaser occurred outside the continental United States). This warranty is extended only to the original purchaser ("Purchaser"). *Purchaser's sole and exclusive remedy is the repair and/or replacement of nonconforming goods as provided in the following paragraphs.*

In the event Purchaser believes the goods are defective, the goods must be returned to HFC, transportation prepaid by Purchaser, within twelve (12) months after delivery of goods (or eighteen (18) months for goods delivered outside the continental United States) for inspection by HFC. If HFC's inspection determines that the workmanship or materials are defective, the goods will be either repaired or replaced, at HFC's sole determination, free of additional charge, and the goods will be returned, transportation paid by HFC, using the lowest cost transportation available.

Prior to returning the goods to HFC, Purchaser must obtain a Returned Material Authorization (RMA) Number from HFC's Customer Service Department within 30 days after discovery of a purported breach of warranty, but no later than the warranty period; otherwise, such claims shall be deemed waived. See the Return Requests/Inquiries Section of this manual.

If HFC's inspection reveals the goods are free of defects in material and workmanship or such inspection reveals the goods were improperly used, improperly installed, and/or improperly selected for service intended, HFC will notify the purchaser in writing and will deliver the goods back to Purchaser upon (i) receipt of Purchaser's written instructions and (ii) the cost of transportation. If Purchaser does not respond within thirty (30) days after notice from HFC, the goods will be disposed of in HFC's discretion.

HFC does not warrant these goods to meet the requirements of any safety code of any state, municipality, or other jurisdiction, and Purchaser assumes all risk and liability whatsoever resulting from the use thereof, whether used singly or in combination with other machines or apparatus.

This warranty shall not apply to any HFC goods or parts thereof, which have been repaired outside HFC's factory or altered in any way, or have been subject to misuse, negligence, or accident, or have not been operated in accordance with HFC's printed instructions or have been operated under conditions more severe than, or otherwise exceeding, those set forth in the specifications for such goods.

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PREFACE

This manual provides all the necessary information to correctly install, operate, maintain and troubleshoot the Model ACC-27 signal conditioner.

The ACC-27 is intended to provide the user with a suitable interface between a frequency generating device and a data acquisition system.

This manual is organized to provide ease of use. Individual sections are provided to cover the Introduction, Installation, Functional Description, Calibration, and Maintenance and Troubleshooting. Illustrations have been used to improve the clarity of information provided in this manual.

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1 INTRODUCTION

1.1 INTRODUCTION

The ACC-27 Modulated Carrier Conditioner/Converter is an active pickoff accessory for the turbine flowmeter which provides a pulse output proportional to flow rate.

The Modulated Carrier eliminates the pickoff drag, associated with conventional magnetic pickoffs, resulting in a significant increase in the usable range of a turbine flowmeter at lower flow rates.

The ACC-27 excites a series MCP pickup mounted on the turbine flowmeter. Sensed through the flowmeter body, the motion of the turbine rotor modulates the coil field, subsequent conditioning provides a pulse output signal where each pulse is representative of a discrete volume of fluid and where the frequency is proportional to flow rate.

Flowmeters compatible with the ACC-27 are available in nominal sizes below two inches. Larger flowmeters do not benefit from a modulated carrier pickup.

1.2 PERFORMANCE CHARACTERISTICS

INPUT

- ! Pickup Type compatible with Series MCP pickoff. Transmission distance dependent on output waveform and drive requirements. Cable type - Belden 8422. Modulation frequency range 10.5 Hz to 3500 Hz.

PULSE OUTPUT

- ! Open collector VMOS transistor 2N6660. Maximum OFF state voltage 60 VDC. Maximum ON current 1.0 amps.
- ! TTL/CMOS fanout of 10 TTL/CMOS loads AC capacitively coupled square wave.

POWER INPUT

- ! 10.5 TO 35 VDC AT 45 Ma

PHYSICAL

- ! Operating 0-70EC
Storage -20-70EC

ENCLOSURE

- ! General purpose case(standard), Nema 4, Explosion Proof enclosure.

1.3 ORDERING INFORMATION

BASIC MODEL ACC27-(A)-(B)-(C)-(D)

PULSE OUTPUT

INPUT POWER

OPTIONAL FEATURE

ENCLOSURE STYLE

PULSE OUTPUT

MODEL ACC27-(A)-()-()-()

OPTION (A)

- (1) OPEN COLLECTOR
- (2) TTL/CMOS
- (3) A/C SQUARE WAVE
- (5) 0-10 V SQUARE WAVE

INPUT POWER

MODEL ACC27-()-(B)-()-()

OPTION (B)

- (1) D/C VOLTAGE 15-35 VDC

OPTIONAL FEATURE

MODEL ACC27-()-()-(C)-()

OPTION (C)

- (PS) PULSE SCALING DIVIDE BY 2,4,8,16,32,64,128,256

ENCLOSURE STYLE

MODEL ACC27-()-()-()-(D)

OPTION (D)

- (1) STYLE 1 CASE, GENERAL PURPOSE
- (3H/O) MEETS CLASS I, DIV. 1 AND 2, GROUP D ONLY
CLASS II, GROUPS E, F, G
CLASS III
NEMA 4X WITH 'O' RING
CERTIFIED CSA, UL
BODY KILARK #GECCT-3, STOCK #200-0945
FLAT COVER, STOCK #200-0533, KILARK #GECBC.
- (3BH/O) MEETS CLASS I, DIV. 1 AND 2, GROUPS A, B, C, D
CLASS I, ZONES 1 AND 2, GROUPS IIB + H2, IIA
CLASS II, DIV. 1 AND 2, GROUPS E, F, G
CLASS III
NEMA 3, 4, 7 (B, C, D), 9 (E, F, G)
CERTIFIED CENELEC, CSA, UL, FM
BODY KILARK #HKB, STOCK #200-0406
DOME COVER, STOCK #200-0405, KILARK #HK2D.

NOTE: INSERT (X) IN MODEL NUMBER FOR EVERY OPTION NOT SPECIFIED.

1.4 WARRANTY

Hoffer Flow Controls warrants that all equipment will be free from defects in workmanship and material provided that such equipment was properly selected for the service intended, properly installed, and not misused. Equipment which is returned transportation prepaid to Hoffer Flow Controls within 12 months after delivery of goods, or 18 months from date of shipment on equipment for destination outside the United States, and is found by Hoffer Flow Controls inspection to be defective in workmanship or material, will be repaired or replaced at Hoffer Flow Controls sole option, free of charge and returned shipped using the lowest cost transportation prepaid.

In the event of product failure contact Hoffer Flow Controls at 252-331-1997 or 800-628-4584, for issuance of a **Returned Material Authorization (RMA)** number.

1.5 ENCLOSURE DETAIL

The ACC27 may be packaged in either the General Purpose case (Style 1), in an Explosion Proof case (Style 3), or in the Nema 4 case (Style 5). Dimensions are given in Figures 1-2, 1-3, 1-4, and 1-5.

Figure 1-2 General Purpose Case (Style 1)

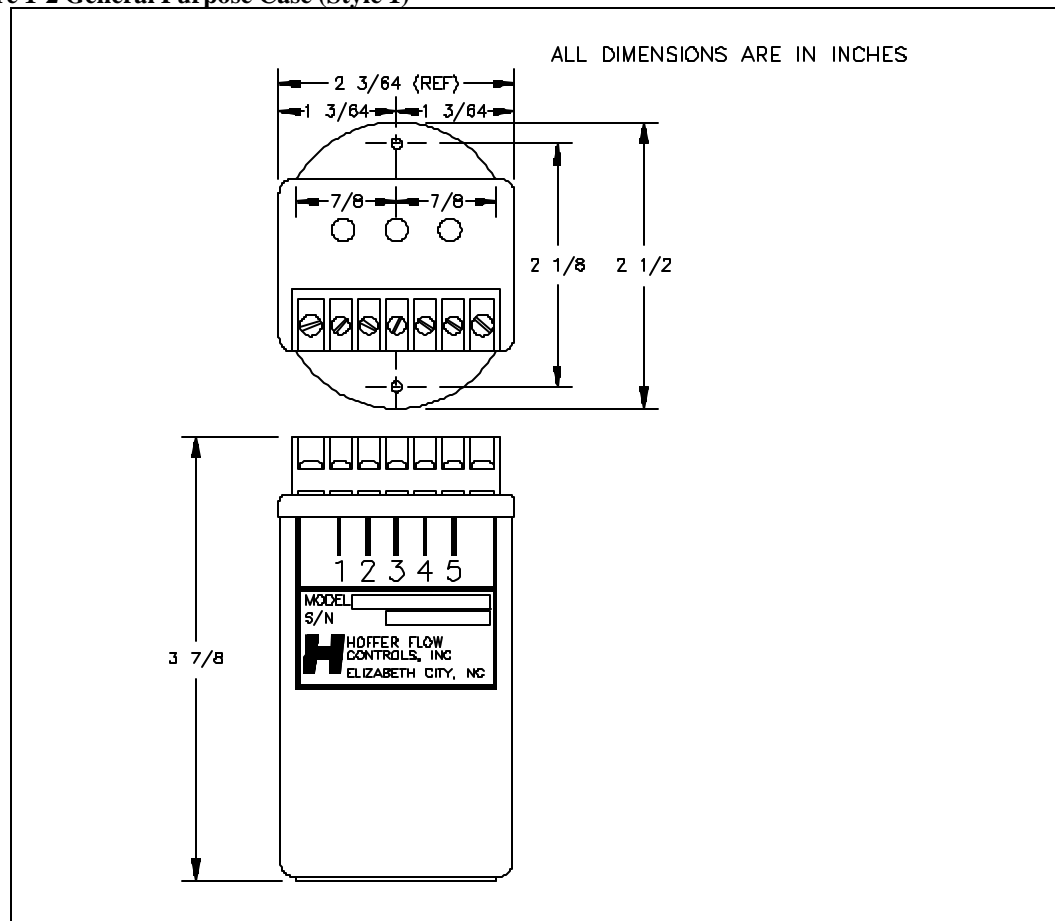


Figure 1-3 Explosion Proof Case (Style 3)

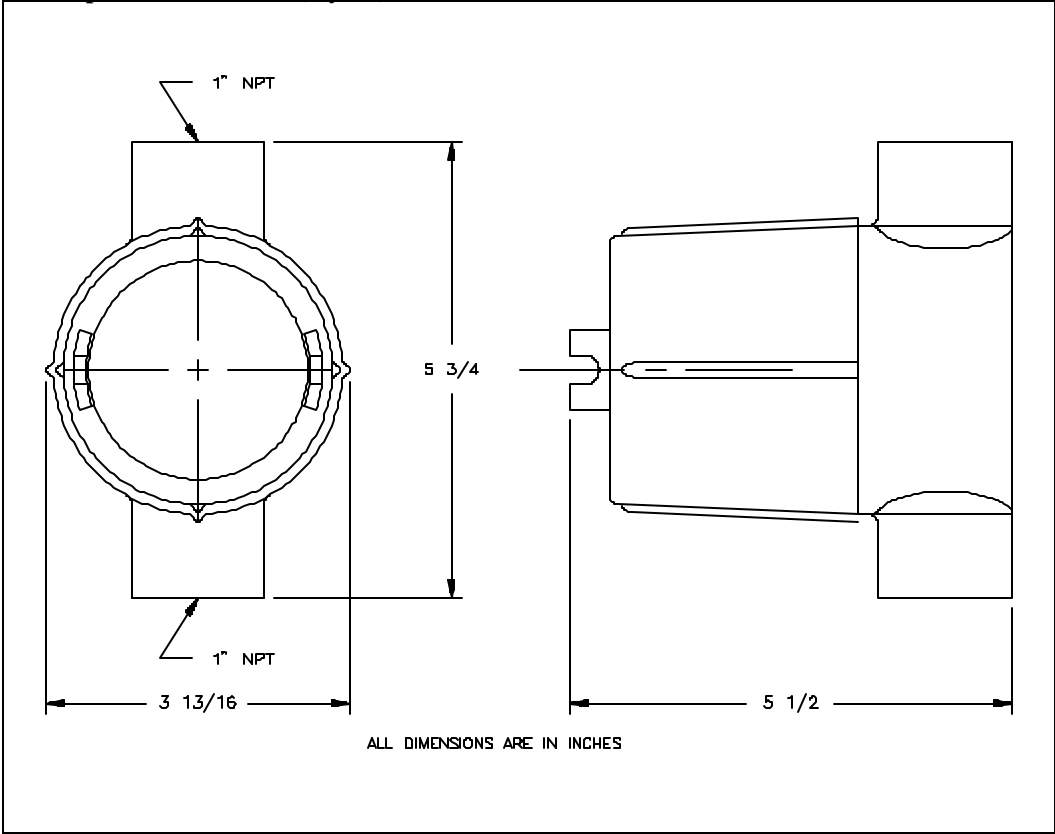
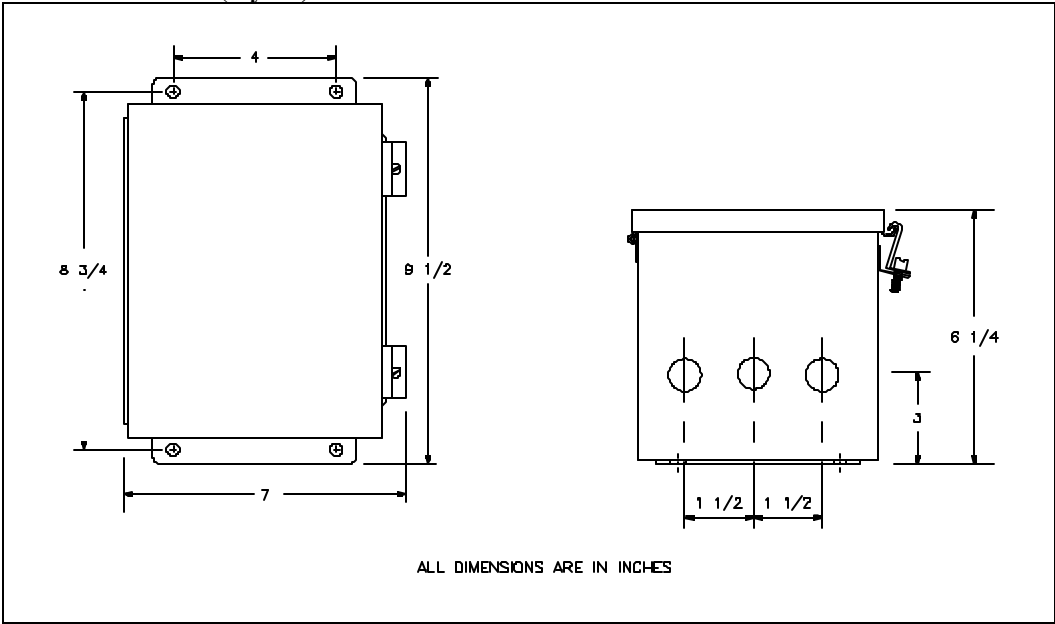


Figure 1-4 NEMA 4 Case (Style 5)



1.6 SHIPPING AND HANDLING

CAUTION - The ACC27 is a static-sensitive device and standard practice for static sensitive parts should be observed.

In the event of malfunctioning equipment the following guidelines should be observed for the preparation and shipment of the equipment. Failure to do so may result in the material reaching its destination damaged.

The electronic unit due to its **STATIC SENSITIVE** nature should be wrapped in a material conforming to MIL-B-81705 , Type II, and packaged in a heat sealable bag conforming to MIL-P-81997. These steps are necessary to protect the equipment from electrostatic charge(s) that may occur during handling.

The package should then be marked with a sensitive electronic device caution label conforming to MIL-STD-129, appendix C. The equipment should then be wrapped in cushioning material, and placed into a close fitting box conforming to PPP-B-636 Domestic class.

The exterior shipping container should be marked with a sensitive electronic device caution label conforming to MIL-STD-129, appendix C.

Clearly mark the factory provided **RMA** number on all paperwork and shipping boxes.

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2 INSTALLATION

2.1 INSTALLATION WIRING LAYOUT FOR INTERCONNECTIONS

In considering the interconnections between the flowmeter and the flow measurement system some attention must be given to anticipated noise sources and to the coupling of these noise sources to the interconnecting wiring.

Noise signals may be coupled inductively or capacitively into the wiring between the flowmeter and the electronic measuring systems. In general, utilizing a shielded, twisted pair for the interconnection greatly reduces this coupling. The shield should be grounded on one end of the cable only. In general, grounding only on the electronic measuring system is best.

However, even with proper interconnecting cabling cross talk with other signal lines or power lines may still occur and should be avoided. Physical isolation of the wiring reduces the chance of potential problems.

The turbine flowmeter equipped with Modulated Carrier Pickup (MCP) should not be located more than 100 feet from the Modulated Carrier Conditioner. It is recommended that the Modulated Carrier Conditioner be installed on or near the flowmeter to assure proper operation.

2.2 INSTALLATION OF ACC-27

The Model ACC-27 should be placed in a convenient location which maintains access to the unit should repairs or readjustment be required.

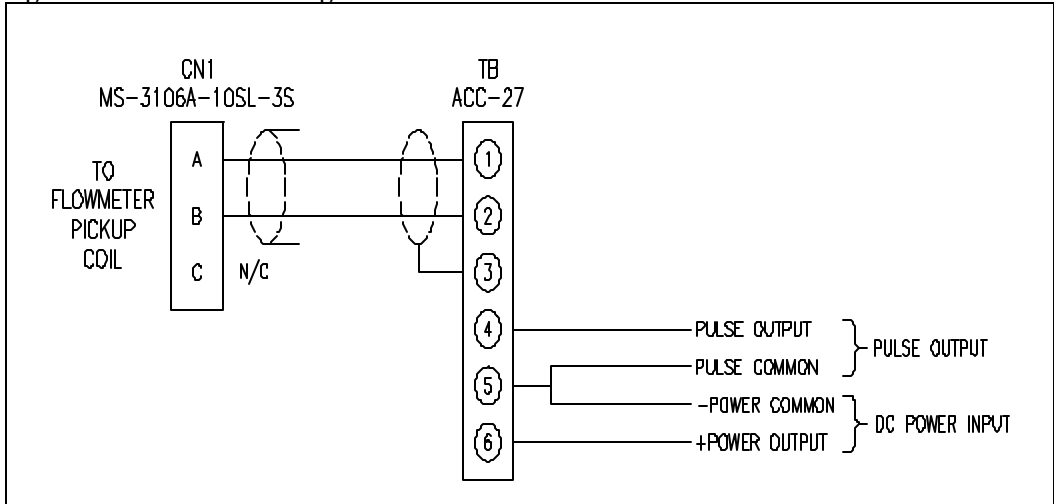
Refer to wiring installation Figure 2.1 for the appropriate terminals for interconnections. Connections to the terminal block should be carefully dressed to avoid having bare wires extend past the screw clamp on the terminal block. This is particularly important for units mounted within the explosion proof enclosure. Wires should be neatly dressed near bottom of enclosure to prevent problems when cover is installed.

Connect two conductor shielded cable from flowmeter to terminals 1 and 2. Connect the shield to terminal 3. Ground the shield at one end only.

Unit is powered by a DC voltage, which must be within 10.5 - 35 VDC. Connect the plus voltage to terminal 6 and the power return to terminal 5.

The output signal from the ACC27 is available in several forms, see model number designation for output type specified. For pulse output connect wire to terminal 4, and connect pulse common to terminal 5.

Figure 2.1 Installation Wiring



3 FUNCTIONAL DESCRIPTION

3.1 INTRODUCTION

The ACC27 is a preamplifier which will provide a frequency pulse output proportional to rate of flow. The unit is intended to provide the user with a suitable interface between a flow measurement sensor and a data acquisition system.

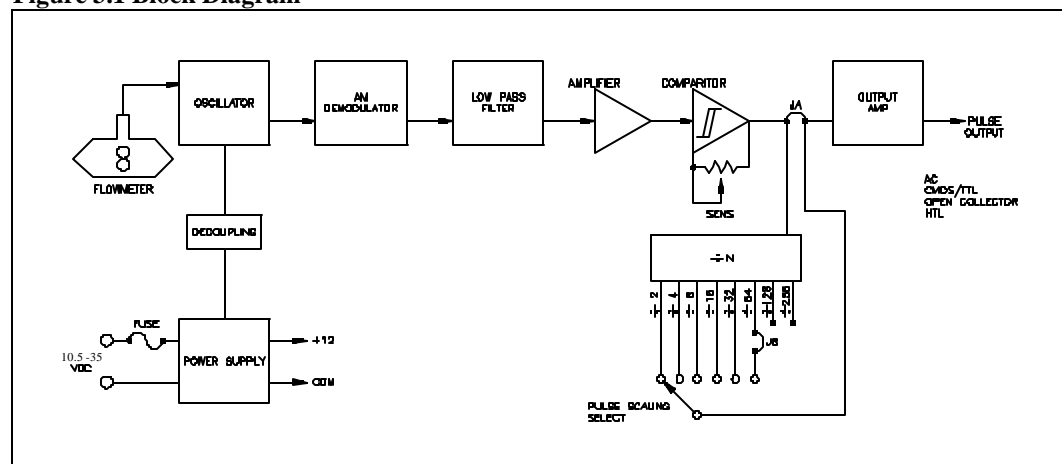
3.2 PRINCIPLE OF OPERATION

A block diagram showing functional blocks of the unit is depicted in Figure 3.1. The principle of operation is as follows.

The MCP pickup on the turbine flowmeter is connected to the ACC27, and forms part of an oscillator circuit, which is excited by the ACC27. Motion of the turbine flowmeter rotor modulates the oscillator output. A demodulator circuit converts the AM signal to a signal at a frequency proportional to the flowrate. The low level demodulated signal is then passed through a signal conditioning chain where it is filtered, amplified and shaped into a train of digital pulses whose frequency is related to the volume flow rate and where each pulse represents a discrete volume of fluid.

The pulse scaling option provides an eight stage binary divider to scale down the output frequency to a slower repetition rate. The scaling factor may be optionally selected as the pulse train is then fed into the output stage which will generate the required pulse output level desired.

Figure 3.1 Block Diagram



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4 CALIBRATION PROCEDURE

4.1 INTRODUCTION

In general, all flow measurement systems supplied by Hoffer Flow Controls have been factory tested and configured as specified by the user, at the time of purchase, free of charge.

The ACC27 requires no field calibration.

4.2 REQUIRED TEST EQUIPMENT

In order to adjust the Sensitivity and troubleshoot the ACC27 the following suggested equipment list is provided:

MANUFACTURE	PART NUMBER	DESCRIPTION
Fluke	8060A	True RMS Multimeter
Spectrol	8-T000	Adjustment Tool

4.3 CONTROLS AND ADJUSTMENTS

SENSITIVITY

A twenty turn control used to set the threshold sensitivity level above the ambient noise pickup.

PULSE SCALING

A six position dip switch used to provide a scaled pulse output of $\div 2$, $\div 4$, $\div 8$, $\div 16$ and $\div 32$ as selected by the manual depression of switch. Other scaling factors may be optionally selected through a factory wired jumper option. These additional factors are $\div 64$ (standard if not specified), $\div 128$, and $\div 256$.

! NOTE - IT IS NECESSARY TO OPEN THE COVER OF THE ENCLOSURE BY REMOVING TWO SCREWS ON SIDE OF BOX AND LIFTING COVER. THE PRINTED CIRCUIT CARD IS ATTACHED. THE "PULSE SCALING" DIP SWITCH MAY BE PROGRAMMED WITH A PEN. INPUT POWER SHOULD BE REMOVED DURING THIS STEP.

Figure 4.1 Control and Adjustment Detail

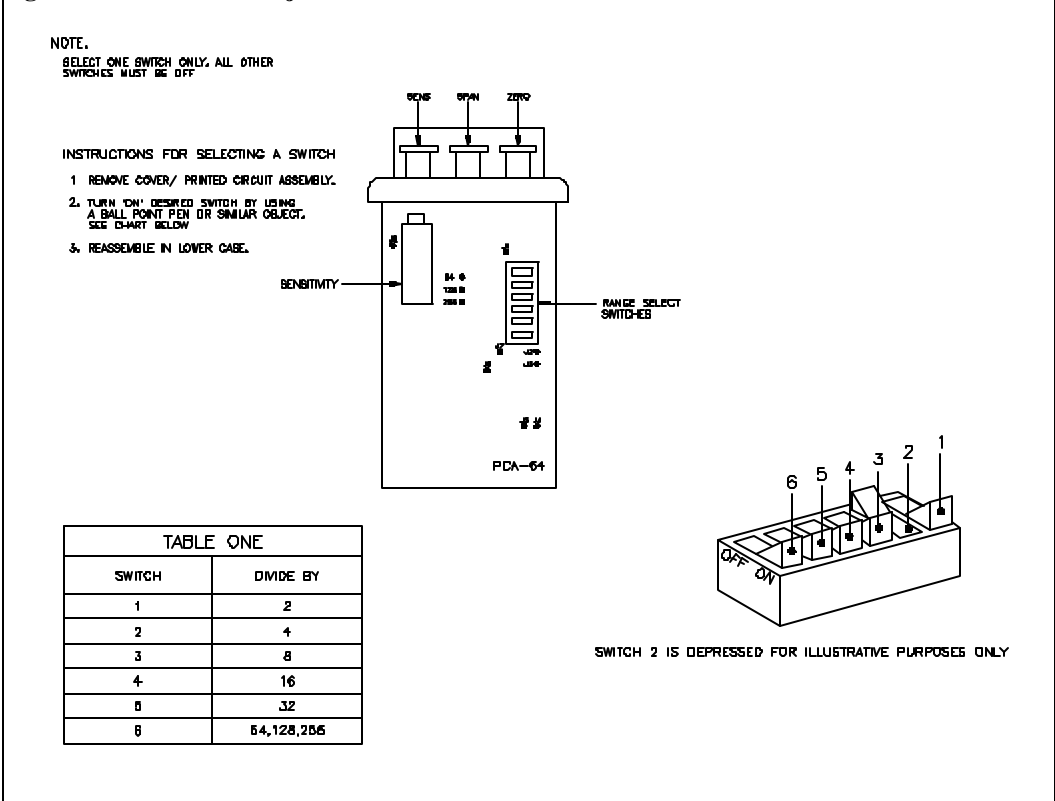
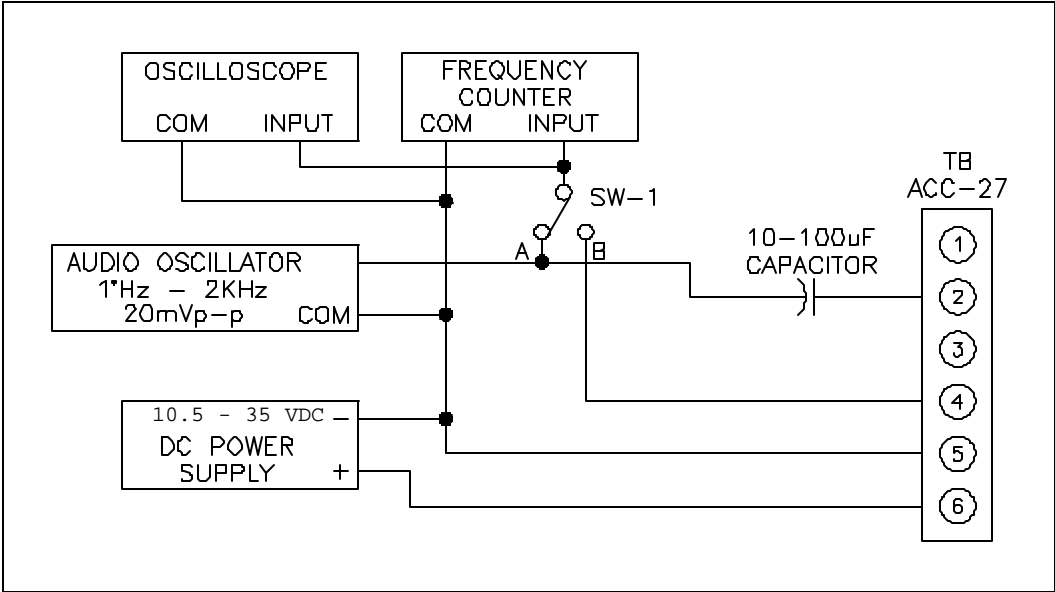


Figure
4.2 Test
Setup



5 MAINTENANCE

5.1 INTRODUCTION

Hoffer Flow Controls flow measurement systems are constructed to give a long service life in the targeted measuring field and service environment. However, problems do occur from time to time and the following points should be considered for preventive maintenance and repairs.

The bearing type used in the flowmeter was chosen to give compromise between long life, chemical resistance, ease of maintenance and performance. A preventive maintenance schedule should be established to determine the amount of wear which has occurred since last overhaul. See users manual for flowmeter for further instructions.

A spare parts list has been provided which, at the discretion of the user, may be user stocked. Consult with the manufacturer if an abridged spare parts list is sought. The recommended spare parts list may be found following this section and in the users manual for the flowmeter.

In case the flow measurement system malfunctions or becomes inoperative, a trouble shooting procedure follows.

Factory consultation is available to assist in diagnosing problems. In addition, factory repair parts and service are available for individuals who wish to utilize this service.

5.2 TROUBLE SHOOTING AND MAINTENANCE

- * ALL PRINTED CIRCUIT CARDS ARE WARRANTED FOR ONE YEAR AFTER DATE OF SALE.
- * ALL PRINTED CIRCUIT CARDS MAY BE FACTORY REPAIRED AT A NOMINAL FEE FOR PARTS AND LABOR AFTER WARRANTY PERIOD.

In case of an inoperable or malfunctioning system the following procedures can be used to isolate the faulty wiring, printed circuit boards and/or alternate causes. The majority of repairs can be made in the field thereby reducing the time a unit is out of service. The necessary documentation is contained within this manual with the exception of the calibration data sheet for the turbine flowmeter. This calibration is supplied separately.

Factory consultation is available to assist in diagnosing problems. Please note that in some cases factory repairs can be performed more easily than can be accomplished in the field.

Failure conditions are listed and the possible corrective actions given to eliminate the observed problem.

OBSERVED CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
! UNIT DOES NOT PRODUCE A PULSE OUTPUT WITH FLOW PRESENT	! POWER LOSS ! BAD PICKUP COIL OR CABLE. ! STALLED TURBINE FLOWMETER. ! BAD ACC27 ! SENSITIVITY ADJUSTED FULLY COUNTER CLOCKWISE	! CHECK INTERCONNECTING WIRING AND HOST SYSTEM. ! CHECK PICKUP COIL AND CABLE FOR CONTINUITY AND LEAKAGE. REPLACE AS REQUIRED. ! REMOVE FLOWMETER AND REPAIR AS REQUIRED BY MANUFACTURERS RECOMMENDATIONS. ! REPAIR OR REPLACE ! ADJUST SENSITIVITY
! PULSE OUTPUT WITH NO FLOW PRESENT	! INPUT NOISE ! BAD PICKUP COIL OR CABLE ! EXTREME SHOCK OR VIBRATION OF PIPING ! POWER SUPPLY MALFUNCTION ! BAD ACC27	! TURN SENSITIVITY CCW UNTIL FALSE OUTPUT STOPS ! CHECK PICKUP COIL AND CABLE FOR CONTINUITY AND LEAKAGE. REPLACE AS REQUIRED. ! DAMPEN OR RELOCATE PIPING ! CHECK AND REPAIR AS REQUIRED ! REPAIR OR REPLACE

5.3 REPLACEMENT PARTS

PART NUMBER	DESCRIPTION
ACC27-(1)-(1)-(-)-(1)	OPEN COLLECTOR PULSE OUTPUT
ACC27-(2)-(1)-(-)-(1)	TTL/CMOS PULSE OUTPUT
ACC27-(3)-(1)-(-)-(1)	AC SQUARE WAVE
ACC27-(5)-(1)-(-)-(1)	0 TO 10 VDC PULSE OUTPUT